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ABSTRACT

"True" maps of the world, as seen from the perspective of the time in which they were produced, remain an ethnocentric visual language in modern times. Students can gain insight into such "true" maps by studying maps produced in the great traditions of the West and East. Teachers can determine a map's appropriateness by identifying its title, date, place of origin, providing a key, determining whether the map is a primary or secondary source, assessing the map's accuracy, comparing it with maps from other cultures, displaying usefulness, analyzing every map for the mapmaker, and evaluating every map as a work of art. A set of learning activities focuses upon the following maps from throughout history: (1) hemisphere map (orthographic projection); (2) central kingdom map (ancient China); (3) point of contact map (globe and flat map); (4) universe map (after Ptolemy); (5) T-O ("terra orbis") map (medieval Europe); (6) Ibn Battuta's travel map (medieval Europe, Asia, and Africa); (7) Columbus' map (Ptolemy); (8) Mercator map (16th century); (9) Robinson map (20th century); and (10) a "true" map (a contemporary example). Activities for each lesson include a description, diagrams, true or false questions, and short-answer questions. (DB)

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Discovering a "True" Map of the World

-- Learning Activities

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SO 022 948

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Introduction

Prior to modern times, many thought that the "true" map of the world was a map in which the earth was at the center and stationary. When that conviction was challenged, some retained the security of this conviction by believing that the sun was stationary and at the center of the world. A more recent insight is that the earth is only one of the smaller satellites in one of an infinite number of galaxies.

The rapid expansion of geographical knowledge in the 16th century prompted the creation of large wall maps of the world. When they proved no longer adequate to accommodate the ever increasing information about the world, a "century of atlases" provided current maps. Given the thirst for details about the "discoveries" and one's own country, map makers turned inward and became specialized in succeeding centuries. In recent times, interest has been renewed in making a "true" map of the world based upon current information.

Technical and technological innovations are among the conditions for the development of making in modern times. However, they are not sufficient to account for changes on the "true" map of the world. Development of new map projections or new instruments for surveying are as much a result of cultural factors as increased ability to make maps. A time lag between many inventions and their adoption in map making was often apparent.

In early modern times, the Great Tradition of the West began to distinguish between the material and the spiritual. Although both aspects of life were explored in ancient and medieval times, the "real" world became the more desirable object to be displayed on maps. "True" maps of the world were devised which were based upon a specific projection and a system of mathematical coordinates. The space occupied by the world was typically

framed with a rectangular border which identified that the map was "true."

Information within this space was, ideally, depicted the same way so that a depiction of any one feature would also depict any other like features on the map. In effect, space was represented as homogeneous. Accordingly, the center of the map on a particular point could be manipulated to fit a specific logical perception about the world. Indeed, Newton has shown, by his laws of gravity, that there was no center. In the words of Pascal,

> the universe is an infinite sphere whose center is everywhere and whose circumference is nowhere.

Although more interested in precision than scope, modern map makers continue to produce new, "true" maps of the world. Consequently, the concept of a "true" map has been expanded in modern times. Two secular characteristics came to dominate modern map making: observation and mathematical ideas. Ironically, these characteristcs often return mapmaking to a traditional view of the world as a whole in which a "true" map is a product of social context.

Information on a current map of the world varies from the particular to the general, subjective to the objective, trivial to significant. Since the map typically serves several functions, appropriate assessment of a "true" map is in accordance with its use. To this end, the mapmaker, map, and map user are to be held to the same criteria of scale, format, currency of information, reference system employed, symbols and graphic language used, and citation of sources.

Many users of the current maps in the West, however, continue to believe that sunrise and sunset are "facts" of everyday life. Thus, a "true" map of the world is drawn around the same axis used in ancient and medieval times. Paraphrasing Oliver Wendell Holmes, it sticks out visibly though the center of each and every town, city, and nation, earth, and sun. Unlike the past, for

them, "true" maps of the world remain an ethnocentric visual language in modern times.

The variety of world maps for developing insight into a "true" map of the world is seemingly infinite; the number is ever increasing. According to recent estimates, the United States government is probably the most prolific producer of current maps. There are about 39 federal agencies involved in making maps. Together, they have produced nearly a quarter-million separate maps. The largest private producer of maps is probably Rand McNally. Each year, it sells about 400 million maps, through its 2,500 or so sheet maps, atlases, and globes.

One way for students to gain insight into these "true" maps of the world is by study of illustrative maps produced in the Great Traditions of West and East. Crucial to the success of relevant learning activities is teacher selection of an appropriate map. Among the criteria used in selecting an appropriate map, "ten commandments" are recommended to be observed:

1. Identify every map with a title.
2. Identify every map by date.
3. Identify every map by place of origin.
4. Identify every map with a key.
5. Identify every map as a primary or secondary source.
6. Assess every map as to accuracy of information.
7. Compare every map with another map from another culture.
8. Show how every map is useful for the student.
9. Analyze the accuracy of every map for the map maker.
10. Evaluate every map as a work of art.

By following these "ten commandments," ten world maps were selected as illustrative springboards for learning activities regarding the "true" map of the world. Intended to increase student knowledge of the history of map

making and developing student map skills, the learning activities focus upon the follow world maps:

1. Hemisphere Map (Orthographic Projection)
2. Central Kingdom Map (Ancient China)
3. Point of Contact Map (Globe and Flat Map)
4. Universe Map (After Ptolemy)
5. T-O Map (Medieval Europe)
6. Ibn Battuta's Travel Map (Medieval Asia, Europe, Africa)
7. Columbus Map (Ptolemy)
8. Mercator Map (Sixteenth Century)
9. Robinson Map (Twentieth Century)
10. "In His Hands" Map (Religious World View)

In carrying out these learning activities, the following procedures are recommended:

(1) Allow adequate time for teaching;

(2) Provide an encouraging instructional environment;

(3) Teach each map skill in small steps;

(4) Correct student mistakes;

(5) Have students practice each skill;

(6) Recycle students through the new materials until they achieve mastery; and

(7) Evaluate student classwork with a pretest and posttest.

These learning activities are illustrative of teaching procedures (3) and (5). Limited to two pages, each learning activity is a self contained module of instruction. On one page, each learning activity is introduced with a Description of a map to be used in developing a map skill. An example of a map is also provided. On the second page, each learning activity provides two opportunities (I, II) to practice the map skill. These opportunities are

intended to provide practice and stimulate class discussion of the learning activity.

Discovering a "True" Map of the World was field tested with junior high school students enrolled in the Northern University High School division of the Malcolm Price Laboratory School, University of Northern Iowa, Cedar Falls, Iowa 50613. These learning activities were infused during an eighth grade class in world geography procedures 1-2, 4, 6-7 were adapted to student maturity. Other ways to develop stimulate student inquiry during a study of world geography can be readily devised by the creative teacher.

To aid the teacher in this task, additional information is provided in a note on each map. A bibliography cites two sources for each learning activity. One source indicates more information about the map; the other source offers suggestions for a more extended learning activity. Through these learning activities, students can discover that the "true" maps of the world have been, and, yet to be, discovered.

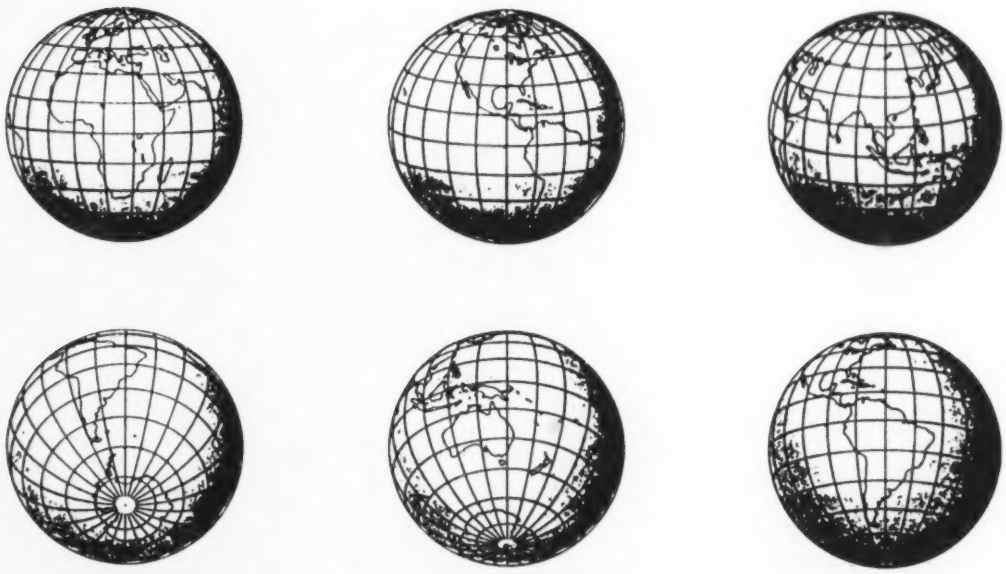
1.

World Map

Description: Among its many uses, a world map illustrates the theme of location in geography. A world map is a graphic representation which helps in understanding where things, concepts, conditions, processes, or events are located in the human world. There are different kinds of world maps; some are specific maps, some general maps. Indeed, anything that can be visualized can be mapped.

A world map can range in size from those on billboards to postage stamps, it can be simple or complex. A world map need not be flat - a globe is a map; they need not be of any place real -- there have been numerous world maps made of imaginary "places" such as the "World of Love." Many world maps reflect a special cultural point of view and the bias of the map maker.

Map: Hemispheres



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A world map illustrates the theme of location in geography.

_____2. A world map can be a written or graphic representation.

_____3. Anything that can be visualized in the human world can be mapped.

_____4. World maps can be of real or imaginary places.

_____5. The world map of Hemispheres is an example of a primary source.

II On a separate sheet of paper:

_____6. Provide an oral definition of the term "world map" in your own words.

_____7. Make a list of five different world maps which illustrate the theme of location in geography.

_____8. Draw a world "home" map which shows location of the homes of five boys and five girls in the world of your class.

_____9. Is it correct to say that a globe is a world map? Explain your answer.

_____10. Which probably was first: language or a map? Give two reasons for your answer.

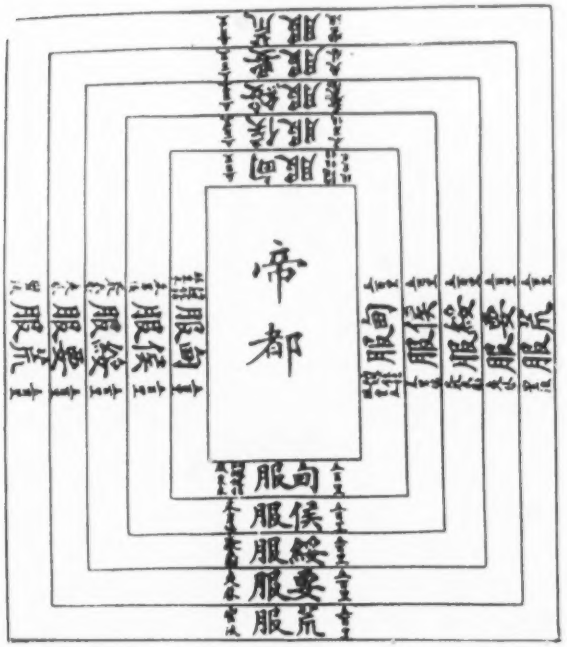
2.

Central Kingdom Map

Description: A "true" map of the world illustrates the theme of place in geography. Usually this "true" map characterizes the map maker's culture as itself at the center. In ancient times, for example, China identified itself as the Central Kingdom, surrounded by "barbarians." Egypt considered the Nile River as the center of life.

In medieval Europe, many thought that Jerusalem was the center of the world. Later, Europe placed itself at the center of its "true" world map. In American classrooms, the United States is often placed at the center of its "true" world maps. Such world maps provide much information and also indicate the map maker's point of view.

Map: The Central Kingdom



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A "true" map of the world illustrates the theme or place in geography.

_____2. A characteristic of a "true" map is to place the map maker's culture at the center.

_____3. "True" maps in both West and East placed the map maker's culture at the center.

_____4. "True" world maps provide information and viewpoints about the world.

_____5. The map of the Central Kingdom is an example of a primary source.

II On a separate sheet of paper:

_____6. Make a list of five characteristics of a "true" map of the world which illustrates the theme of place in geography.

_____7. Identify five distortions on the maps of the Central Kingdom.

_____8. Contrast and compare the world map of the Central Kingdom with a current world map.

_____9. Write the following statement in your own words: Distortions in maps from other cultures are easily identified but misrepresentations by one's own culture are more difficult to detect.

_____10. Is it correct to say that differences among world maps are differences in view points of the map makers? Explain your answer.

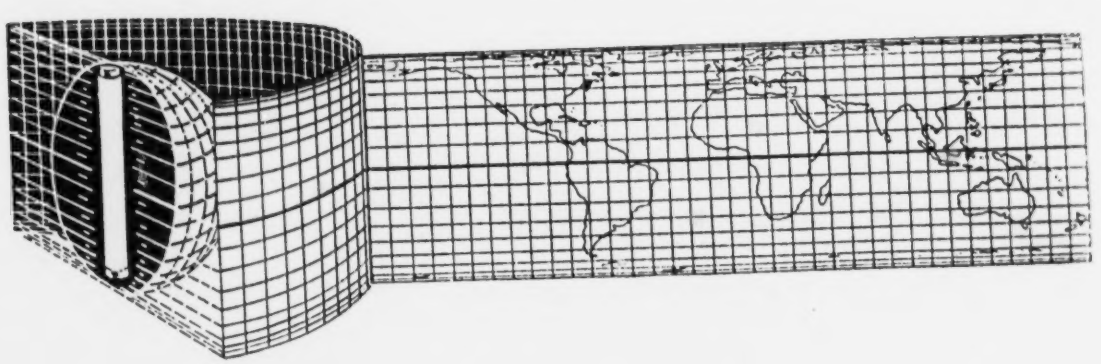
3.

Antaeus' Map

Description: The myth of Antaeus provides an insight into the theme of location in geography. This ancient Greek myth tells about a great giant named Antaeus who was the son of the god of the sea, Poseidon, and of Gaea, the goddess of the earth. As Antaeus grew, he became a wrestler. As long as he kept in touch with his mother, Antaeus was the strongest wrestler in the world. But, when he lost touch with his mother, Antaeus became weak.

The myth of Antaeus helps to identify an accurate world map. Like Antaeus, a world map is most accurate at the point of contact with a globe. A world map on a <u>flat</u> piece of cardboard placed against a globe is most accurate at the point of contact. The farther away from this point, the less accurate would be the world map. Making these lines as accurate as possible requires much mathematical wrestling according to the same rules of the game as for Antaeus.

Map: Point of Contact



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. The story of Antaeus provides an insight into the theme of location in geography.

_____2. A flat world map is most accurate at the point of contact with a globe.

_____3. Any point of contact between a flat world map and a globe is accurate at that point.

_____4. If a flat world map bends to a curve of a globe, then any point on this line is accurate.

_____5. The story of Antaeus is an example of a primary source.

II On a separate sheet of paper:

_____6. Place a piece of glass against a globe at one point and traces a map of the world. At what point(s) is the map most accurate?

_____7. Place a sheet of paper loosely around a globe amd traces a map of the world. At what point(s) is the map most accurate?

_____8. Write a story about the greatest map maker in the world who makes a world map but does <u>not</u> follow the rules of Antaeus.

_____9. Analyze the reasoning of the following statement. A book on world map making could be named after Antaeus as a book of maps is named after Atlas.

_____10. Evaluate the following statement as an illustration of the theme of location in geography: World maps have two kinds of contact with the real world: points and lines. Often, these are the only locations where a map is accurate.

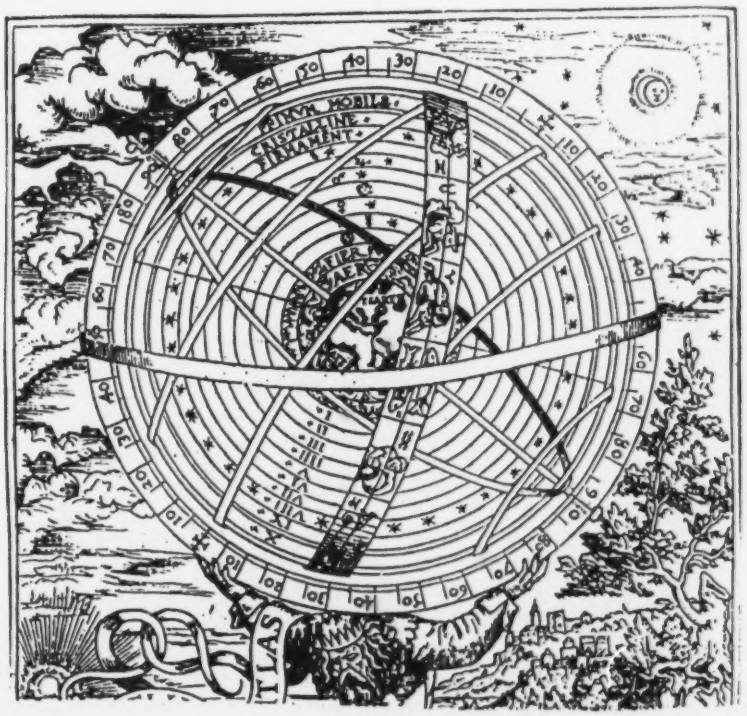
4.

Universe Map

Description: In ancient and medieval times, many thought that the location of earth was at the center of the universe. This classical vision into the theme of location in geography was challenged in modern times. As science developed over the centuries, more came to believe that the sun was at the center of the universe or the solar system.

In the solar system, it was discovered that the planets move in elliptical orbits. Gradually, scientific interest shifted from the planets to the stars and galaxies. Current scientific maps of the universe are based upon various models of a universe in evolution. The center of the universe is difficult to determine. Some say that there is no center.

Map: A "Classical" Vision



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I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A map of the universe illustrates the theme of location in geography.

_____2. Over the years many people have changed their minds regarding the center of the universe.

_____3. On modern maps of the universe, the sun is at the center.

_____4. On the "classical" vision map, the earth is at the center.

_____5. The "classical" vision map is an example of a secondary source.

II On a separate sheet of paper:

_____6. Estimate the era (ancient, medieval, middle, or modern times) of the "classical" vision map. Give two reasons for your estimate.

_____7. Contrast and compare the "classical" vision map with a model of the universe in your science textbooks.

_____8. Use library references and determine a contribution in devising a modern map of the universe made by: Ptolemy, Copernicus, Galileo, Kepler, Einstein.

_____9. Tell in your own words what the following statement is saying about the center of the universe: The center of the universe sticks out visibly through the center of each and every town, city, and nation, earth, and sun.

_____10. Make a poster about the coming end of the world. Include a map demonstrating the theme of location in geography which shows the location of the earth in the universe. Annotate the poster with a brief explanation of your map.

5.

T-O Map

Description: A T-O map is one of the earliest type of printed maps in Europe illustrates the theme of region in geography. T-O maps appeared at the end of a long tradition of manuscript diagrams of the world. The T, or terra, represents the inhabited earth; the O, or orbis, stands for the circle of the world or the ring of the ocean in which the world is enclosed. Over one thousand such maps survive in medieval manuscripts.

A T-O map uses a basic image nearly two thousand year old. The Greeks and Romans continued a tradition of illustrating the earth as a circle of land surrounded by water. They also divided the land into the three regions of Asia, Africa, and Europe, each marked off by a body of water. The European medieval mind adapted this T to divide waters according to its regional point of view.

Map: T-O Map

I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A T-O map illustrates the theme of region in geography.

_____2. A T-O map is a map of the world from a European regional point of view.

_____3. According to a T-O map, there are three regions in the world.

_____4. A T-O map represented a new image of the world.

_____5. The example of a T-O map is a primary source.

II On a separate sheet of paper:

_____6. Redraw the T-O map and label it with English words.

_____7. Contrast and compare the T-O map with other maps of the Holy Land.

_____8. Analyze the basic image represented by this T-O map.

_____9. Devise three criteria which, if applied to this T-O map, would indicate that it represents a religious view of the world.

_____10. Assess the T-O map as an illustration of the theme of region in geography.

6.

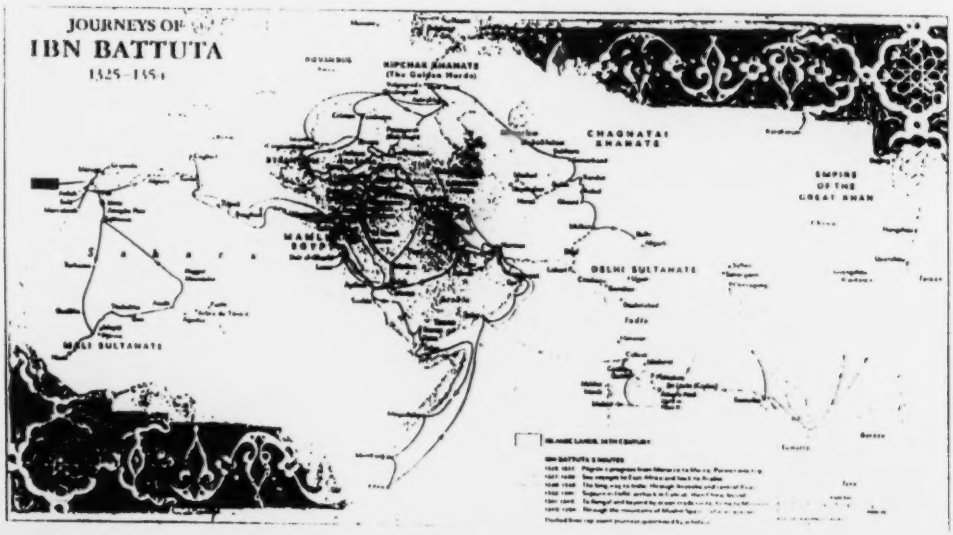
Travel Map

Description: Reading the reports of travelers of others is one way to gain insight into the theme of movement in geography. An example of a "world class" traveler was Ibn Battuta who traveled throughout Asia, Europe, and Africa from 1325-1354 AD. In 29 years of travel, he tripled Marco Polo's travels in number of miles.

Thomas Abercrombie followed Battuta's travels recently. He wrote:

> Ibn Battuta never dwells on what drove him on. Curiosity? Perhaps it was to greet the stars with a sage on a remote mountain-top..., to breathe the white winter winds of the Russian steppes or the spices of a Persian bazaar, to dine with kings or share a crust with a passing nomad. More likely it was a quest for knowledge. <u>One never seduced by a foreign culture can never appreciate the fetters of his own</u>.

Map:



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I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. Reading about the travels of others is one way to gain insight into the theme of movement in geography.

_____2. Ibn Battuta was a "world class" traveler in ancient times.

_____3. Ibn Battuta traveled more miles than Marco Polo.

_____4. Ibn Battuta's home was probably in Europe.

_____5. The map of Ibn Battuta's travels is an example of a primary source.

II On a separate sheet of paper:

_____6. Write in your own words Thomas Abercrombie's explanation for Ibn Battuta's motivation for travel.

_____7. Contrast and compare the travels of Ibn Battuta with your travels by making a chart of five differences and five similarities.

_____8. Trace one of Ibn Battuta's routes on an outline map.

_____9. Analyze the reasoning of Thomas Abercrombie's last sentence (underlined).

_____10. Evaluate the travels of Ibn Battuta as an illustration of the theme of movement in regard to communication, diffusion, and global awareness.

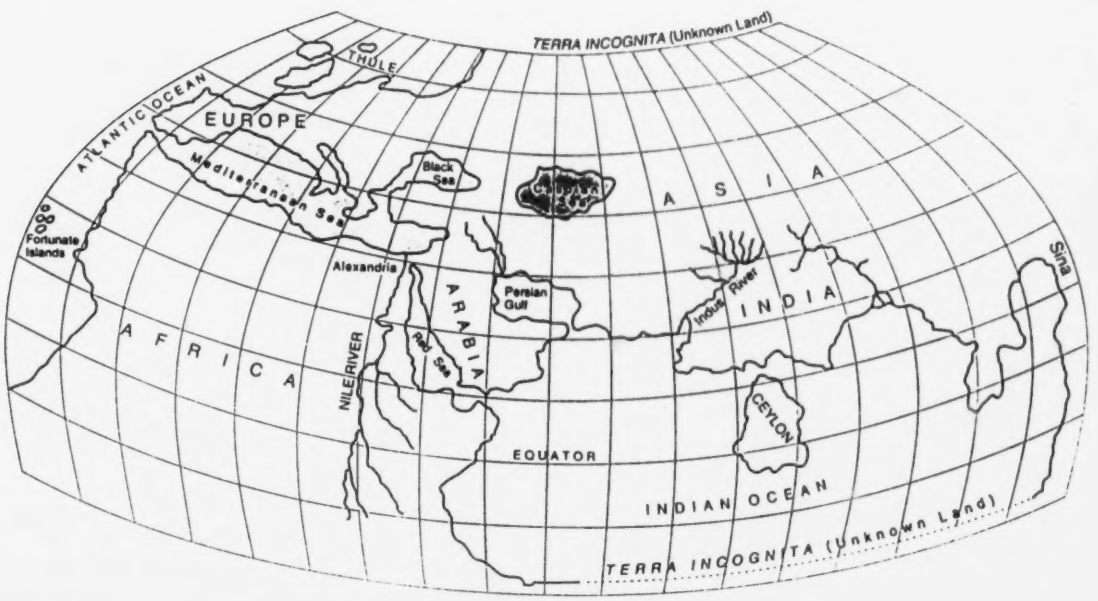
7.

Columbus' Map

Description: Before Columbus, a world map was like an orange cut in half. The world maps produced in each half illustrate the theme of region in geography as neither recognized that the other half existed. The world perceived through maps rather than the world as it really was, however, eventually pointed the way to America.

Especially influential was the rediscovery of maps made by Ptolemy, an ancient mapmaker. Their information was out of date but their use of coordinates stimulated change in map making from an art to a science. Columbus owned some of Ptolemy's maps; they were probably the major source for his decision to sail west into the ocean.

Map: Ptolemy Map



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. World maps produced before Columbus illustrate the theme of region in geography.

_____2. Ptolemy was a map maker during the time of Columbus.

_____3. On Ptolemy's maps the American continents were shown.

_____4. For Columbus, China was due west from Europe.

_____5. A Ptolemy map is an example of a primary source.

II On a separate sheet of paper:

_____6. Rewrite the following definition by Ptolemy of geography in your own words: Geography is "a representation in picture of the whole world together with the phenomena which are contained therein."

_____7. Contrast and compare the map by Ptolemy with another map of the world.

_____8. Analyze the Ptolemy map and list three inaccuracies on the map.

_____9. Which of the following geometric shapes is most like the map by Ptolemy: a cone, a plane, or a cylinder? Explain your answer.

_____10. Evaluate the map by Ptolemy as a regional map of the world.

8.

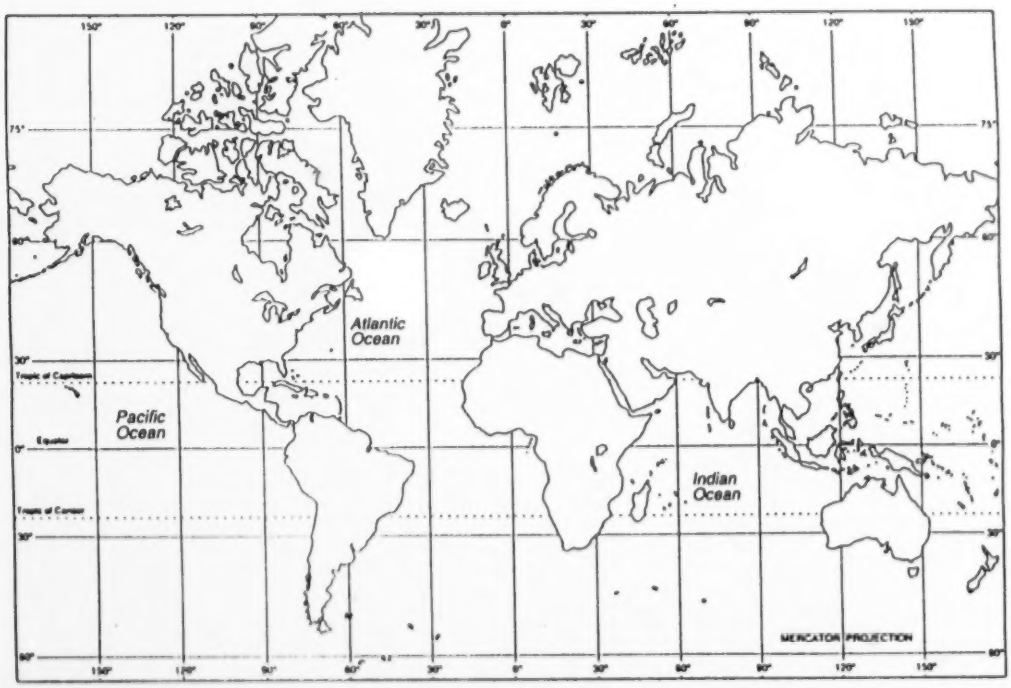
Mercator Map

Description: One of the best know special purpose maps of the world was made by Gerhard Mercator (1512-1594). Especially useful for illustrating the theme of movement in geography, a Mercator map shows almost the whole world on a single sheet. It does not seem to distort shapes of the continents.

When Mercator published his map in 1569, he said:

> If you wish to sail from one port to another, here is a chart, and a straight line on it, and if you follow this line carefully you will certainly arrive at your destination.

Map: Mercator Projection



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A Mercator Map illustrates the theme of movement in geography.

_____2. The quotation by Mercator is an example of a primary source.

_____3. A Mercator map of the world is especially useful for sailors.

_____4. A Mercator map does not distort size of nations.

_____5. A Mercator map uses different scales.

II On a separate sheet of paper:

_____6. List five useful features about a Mercator map.

_____7. Use a Mercator map, and identify the five largest nations in the world. Is your identification correct? Explain your answer.

_____8. Is it correct to say that the United States is larger than Brazil according to a Mercator map? Give two reasons for your answer.

_____9. Contrast and compare a Mercator map with a map drawn according to a different projection.

_____10. Devise a set of criteria which, if applied to various world maps, would indicate why the Mercator map is one of the best known maps of the world.

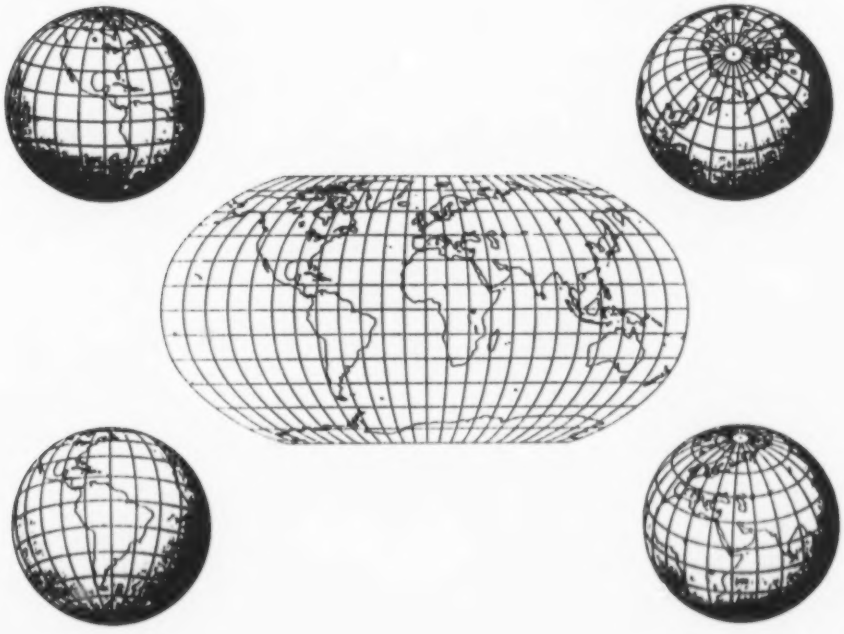
9.

Robinson Map

Description: An important characteristic of a world map is its "frame." A "frame" may be rectangular, circular, or variation of both. The choice of a "frame" for world maps illustrates the theme of place in geography. In 1989, the American Cartographic Association (ACA) condemned the use of rectangular world maps.

As an alternative, the ACA supported use of the Robinson map devised in 1963. On a Robinson map, the whole earth is shown with "reasonable" shapes. It is not precisely an equal area map, especially in the high latitudes, but does provide better shapes in the mid and low latitude regions.

Map: Robinson Projection



I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-), if the statement is false.

_____1. A Robinson map illustrates the theme of place in geography.

_____2. Robinson is a modern map makers.

_____3. A rectangular map is as accurate as a round map of the world.

_____4. A Robinson map has no distortions of land areas.

_____5. A Robinson map is an example of a primary source.

II On a separate sheet of paper:

_____6. List five useful features about a Robinson map.

_____7. In 1988, the National Geographic Society adopted this map as its "official" map. It replaced the Van der Gritten world map (1904), which showed the entire earth in a circle. The Van der Gritten world map had been used by the National Geographic Society from 1922-1988.Suppose you were an editor at the National Geographic Society, give three reasons why you would choose the Robinson map rather than the Van der Gritten map.

_____8. Draw a different "frame" for a world map which is "better" than a hemisphere map. Indicate in a key, three accurate features of the map.

_____9. Contrast and compare a Robinson map with a Mercator map.

_____10. Analyze the reasoning of the following statement: Whereas the earth is round, map publishers should stop using rectangular maps.

10.

A "True" Map

Description: A recent six-part PBS television series, The Shape of the World, stimulated interest in the theme of relationships in geography The book produced for the series offers a slightly different version of but it agrees that an Apollo 8 astronaut's photograph of Earthrise provided that first proof of the "true" map of the world.

For the astronaut, the view of Earthrise revealed earth to be a "very beautiful and fragile Christmas tree ornament, an object insignificant in the enormous cosmos and needing to be handled with care." For the authors, "the human eye could (now) see that the Earth really was round,...the final answer to the puzzle which had gripped the human mind for thousands of years."

Map: In "His" Hands

I Mark with a plus (+) by each of the following statements if the statement is true. Mark a minus (-). if the statement is false.

_____1. The "true" shape of the world is illustrated the theme of place in geography.

_____2. A "true" relationship between the human eye and the Earth is that the Earth can be seen as round.

_____3. The book produced for the video series is an example of a primary source.

_____4. "In His Hands" Map is the map used by an astronaut.

_____5. Both Earthrise and "In His Hands" are maps.

II On a separate sheet of paper:

_____6. Make a cartoon illustrating a view of the earth as an example of the theme of relationships.

_____7. Contrast and compare a photograph of Earthrise with the "In His Hands" map.

_____8. Analyze the reasoning of the following statement: A photograph enables the human eye to see that the Earth was really round.

_____9. Write a four line poem which describes a "true" relationship of the world from the perspective of the maker of the "In His Hands" map.

_____10. Is it correct to say that the "In His Hands" map is the true map of the world. Explain your answer.

Notes

1. These world maps are drawn with an orthographic projection. They "look right" because the increase in distortion toward the edges matches the normal perspective foreshortening which occurs when one observes a sphere. In visual terms, it is a realistic view of a globe. Each map shows only a hemisphere, but a matched pair shows the whole earth.

2. This world map is a diagram of the world according to the ancient Chinese. They considered the world as a series of rectangular world zones. At the center was the imperial palace. In order of importance were the zones of imperial domain, those who paid tribute, border peoples, friendly barbarians, and those who have no civilization. Like the Romans, they thought of the world as a grid which identified fixed distances.

3. This world map is drawn on a cylinder of the same area. It is a cylinder surrounding the globe completely. On the cylinder, a world map is drawn as if the globe was a translucent sphere. On the globe, the pole is a point. On the world map, it is the top of a rectangle. The meridians that come together at the pole on the globe are distributed as wide apart there as on the equator. A quite different world map would result if the point was the center of the globe rather than the pole.

4. This map is a 1559 map of the universe according to Ptolemy. It shows the views of Aristotle who taught that the universe was made up of

spheres on which the sun, moon, planets, and stars were fixed. The basic elements of life were earth, water, fire, and air. Earth was at the center. It did not move but the sky did. Atlas held up the universe. Beyond the outermost sphere, there was nothing but God's invisible presence.

5. This map of the world is according to Isidore of Seville (599-636). It was the first printed map in Western Europe (1472) and represents an older, religious view quite in contrast to various sea charts and other world maps in existence. The language is Latin. Its accuracy is of perception rather than observation. Several variations of this map were devised.

6. This map of the travels of Ibn Battuta is a modern map rather than a map which he used. Thomas Abercrombie has visited this area often. His earlier comments (1985), are noted in "Arabia's Frankincense Trail" in the October issue of the National Geographic. Both his and Ibn Battuta's travels can be traced on the insert map (1991) of the Middle East in the February issue of the National Geographic.

7. Several world maps before and after the voyages of Columbus are displayed in a currently travelling exhibition entitled Maps and the Columbian Encounter. An interpretive guide is provided by J. Harley. For the exhibit, Circa 1492, a study guide with slides is available on loan from the National Gallery.

8. The Mercator projection is conformal and can show any rhumb as a straight line. It exaggerates sizes and distorts shapes away from the equatorial areas. It does not show true direction since all great circles, other than the meridians and the equator, are complex curves. Nevertheless, it is probably the most common world map used in classrooms.

9. Robinson's reactions (1987) are noted in "Reflections on the Gall-Peters Projection," Social Education April/May.

10. Distortions of various world maps are discussed by Phil Porter, 1986, "Distortions in Maps" Focus, Summer 36:2, pages 22-30. Particularly useful is his comparison of the Gall/Peters projection with other "true" maps. Peters' projection is a modification of projections made by James Gall in the nineteenth century (1885) and Johann Lambert (1728-1777) in the eighteenth century.

Sources for Learning Activities

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